

REMARKS

Claims 29-41 are currently pending in the present application.

Claims 1-11 and 23-26 have been canceled. Claims 12-22 and 27-28 were previously canceled. New claims 29-41 have been presented to more particularly point out and distinctly claim various embodiments of Applicants' invention wherein the tantalum films contain no grain boundaries and possess either a single crystal or amorphous microstructure. Support for new claims 29-41 can be found throughout the Specification, including the Examples, and in the original claims, for example, at page 11, lines 14-17. The amendments made herein introduce no new matter. Additionally, a complete listing of all claims ever presented is set forth herein in accordance with 37 CFR §1.121(c)(1). Entry of the amendments made herein is respectfully requested.

Prior Art Rejections:

In the final Office Action, the Examiner rejects claims 1-4 under 35 U.S.C. §102(b), as being anticipated by the Zhang, *et al.* reference, entitled "Formation of low resistivity alpha Ta by ion beam sputtering," J. Vac. Sci. Technol., Volume B 21(1), Jan/Feb 2003, pages 237-240 ("Zhang"). In the final Office Action, the Examiner rejects claims 1-4 and 24 under 35 U.S.C. §102(a), as being anticipated by the Yuan, *et al.* reference, entitled "A new method for deposition of cubic Ta diffusion barrier for Cu metallization," Thin Solid Films, Volume 434, pages 126-129 (2003) ("Yuan"). In the final Office Action, the Examiner rejects claims 1-4 and 24 under 35 U.S.C. §102(b), as being anticipated by, or in the alternative, under 35 U.S.C. §103(a), as being unpatentable over the Catania, *et al.* reference, entitled "Low-resistivity body-centered cubic tantalum thin films as diffusion barriers . . .," J. Vac. Sci. Technol., Volume A 10(5), Sep/Oct 1992, pages 3318-3321 ("Catania"). In the final Office Action, the Examiner rejects claims 1-4 and 24 under 35 U.S.C. §102(b), as being anticipated by, or in the alternative, under 35 U.S.C. §103(a), as being unpatentable over the Ino, *et al.* reference, entitled "Ion



energy, ion flux, and ion species effects on crystallographic and electrical properties of sputter-deposited Ta thin films,” J. Vac. Sci. Technol., Volume A 15(5), Sep/Oct 1997, pages 2627-2635 (“Ino”). Finally, in the final Office Action, the Examiner rejects claim 24 under 35 U.S.C. §103(a), as being unpatentable over Zhang, in view of the Chen, *et al.* reference, entitled “Phase formation behavior and diffusion barrier property of reactively sputtered tantalum-based thin films used in semiconductor metallization,” Thin Solid Films, Volume 353, pages 264-273 (1999) (“Chen”).

Applicants have canceled claims 1-28. Accordingly, the Examiner’s rejections are moot. However, in the event the Examiner is inclined to apply the cited references in support of a similar rejection or rejections as to new claim 29-41, Applicants respectfully traverse any such potential rejections for at least the following reasons.

Various embodiments of Applicants’ claimed invention, as amended herein, are directed to tantalum thin films having no grain boundaries and either an amorphous microstructure or a single crystal microstructure.

None of the cited references teaches, let alone suggests, the claimed tantalum thin films having no grain boundaries with the recited microstructure characteristics. There is nothing in any of the cited references to motivate one of ordinary skill in the art to modify their teachings in order to arrive at Applicants’ claimed invention. Furthermore, one of ordinary skill in the art would have no reasonable expectation of successfully preparing such tantalum films based on the teachings of the references.

Accordingly, Applicants submit that none of the cited references anticipates the claimed invention or satisfies the criteria necessary to establish *prima facie* obviousness as to the claimed invention.



In conclusion, Applicants respectfully submit that all pending claims patentably distinguish over the prior art of record. Reconsideration, withdrawal of the rejections and a Notice of Allowance are respectfully requested.

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Respectfully submitted,

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